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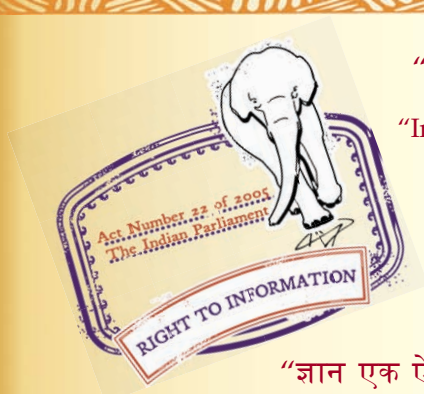
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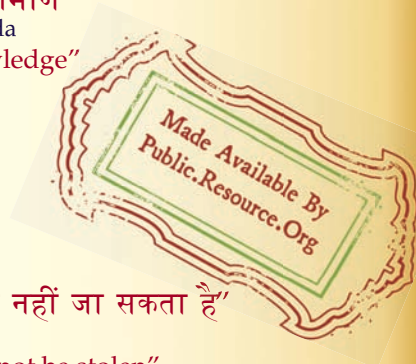
IS 1448-13 (1960): Method of test for petroleum and its products, Part 13: Colour by Lovibond tintometer [PCD 1: Methods of Measurement and Test for Petroleum, Petroleum Products and Lubricants]



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“Knowledge is such a treasure which cannot be stolen”



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**IS : 1448 [ P : 13 ] - 1960**

( Reaffirmed 2003 )

# ***Indian Standard***

## **METHODS OF TEST FOR PETROLEUM AND ITS PRODUCTS**

**[ P : 13 ]**

### **COLOUR BY LOVIBOND TINTOMETER**

( Fourth Reprint DECEMBER 1998 )

**UDC 665.5 : 535.65**

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## COLOUR BY LOVIBOND TINTOMETER

(P: 13)

*Adapted, with permission, from the Institute of Petroleum Standard No. IP 17/52*

### 1. SCOPE

**1.1** Two methods are prescribed for the determination of colour of practically all petroleum products (dyed or undyed) except black oils; solid products such as petrolatum and waxes are tested in the molten state. The colour of the material is determined by comparison with either (a) a series of red, yellow, and blue standard colour glasses as in Method A or (b) IP standard colour glasses as in Method B. The IP standard colour glasses are used only for determining the colour of refined undyed motor fuel, white spirit, or kerosine in an 18-in cell.

**1.2** With the first series of glasses, the instrument functions as a trichromatic colorimeter, and may be used to measure the tint and depth of colour in Lovibond units, while, with the second series of glasses, the colour is expressed in terms of a restricted range of units peculiar to the petroleum industry.

### 2. OUTLINE OF METHODS

**2.1** Light reflected from a white background passes through the cell containing the sample, and thence to the viewing tube, where it illuminates one-half of the field of view. The other half of the field of view is illuminated by light from the background, which passes through the colour standards. A blue 'daylight' filter is incorporated in the viewing tube; in older models of the apparatus blue diffusing screens are fitted in the light cabinet and there are no colour filters in the viewing tube. The colour standards are mounted in racks of up to nine slides each, arranged so that the colours may be moved into the field of view as required. The value of the standard or combination of standards which gives the best match is recorded as the colour of the material. If the material is too bright to be matched by the standard glasses, its colour is dulled by interposing glasses of neutral tint between the sample and the viewing tube. For some purposes, a standardized depth of material is used but, as this is not always the case, the depth of material used in the test shall always be stated.

**2.2** The numerical values of the red, yellow, and blue colours in Lovibond units are additive, and are related so that equal amounts of the three colours make a neutral or grey tint, but the numerical values of the IP standard glasses are not additive.

### 3. APPARATUS

**3.1 Lovibond Tintometer** (*see Fig. 1, 2 and 3*) — of the BDH pattern, with a White Light Cabinet illuminated by two 60-W single coil pearl lamps of a rated voltage chosen to suit the available electricity supply.

**3.2 Colour Standards** — of the following ratings :

a) *Lovibond Units*

|                  |                                                             |
|------------------|-------------------------------------------------------------|
| Red (series 200) | 0.1 to 0.9, 1 to 9, 10 to 19, 20, 30, 40,<br>50, 60 and 70. |
|------------------|-------------------------------------------------------------|

|                     |             |
|---------------------|-------------|
| Yellow (series 510) | As for red. |
|---------------------|-------------|

|                    |                     |
|--------------------|---------------------|
| Blue (series 1180) | 0.1 to 0.9, 1 to 9. |
|--------------------|---------------------|

|              |                         |
|--------------|-------------------------|
| Neutral Tint | 0.1 to 0.9, 1, 2 and 3. |
|--------------|-------------------------|

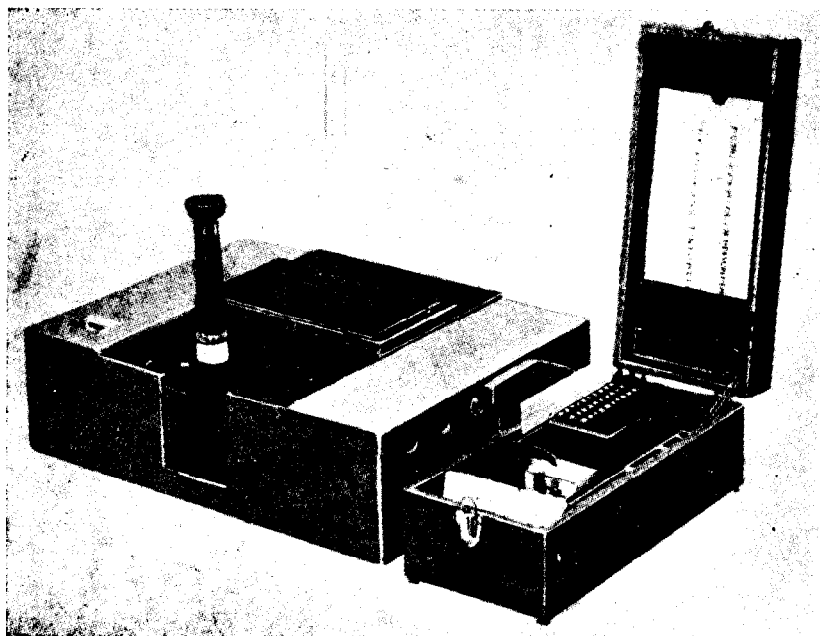


FIG. 1 TINTOMETER ARRANGED FOR VIEWING SHORT CELLS

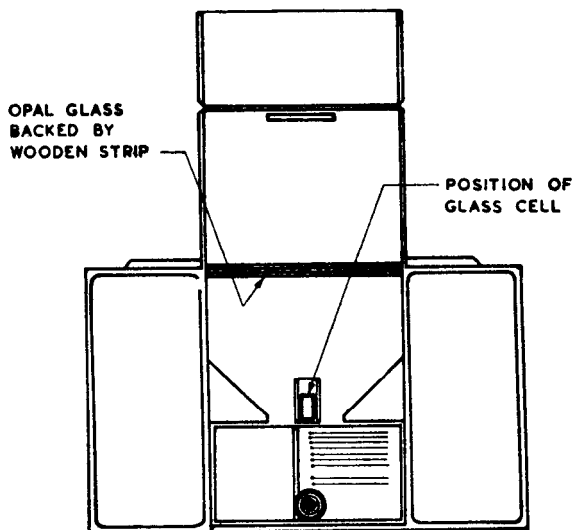


FIG. 2 PLAN OF TINTOMETER

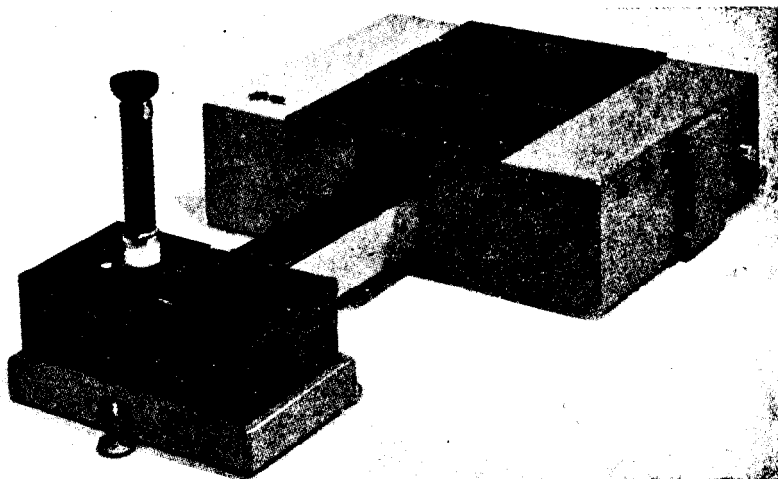


FIG. 3 TINTOMETER ARRANGED FOR VIEWING 18-INCH CELL,

b) *IP Standard Glasses* — These glasses fit into the two slots nearest the viewing tube, and are equivalent to the following combinations of Lovibond colours:

| IP STANDARD GLASSES    | LOVIBOND COLOURS |           |
|------------------------|------------------|-----------|
|                        | Yellow (510)     | Red (200) |
| Water White (0.25)     | 0.2              | 0.43      |
| Water White (0.5)      | 0.81             | 0.44      |
| Water White (0.75)     | 1.6              | 0.45      |
| Water White (1.0)      | 2.3              | 0.46      |
| Superfine White (1.25) | 3.1              | 0.49      |
| Superfine White (1.5)  | 3.9              | 0.53      |
| Superfine White (1.75) | 4.75             | 0.57      |
| Superfine White (2.0)  | 5.6              | 0.6       |
| Prime White (2.25)     | 10.0             | 0.8       |
| Prime White (2.5)      | 15.0             | 1.0       |
| Prime White (2.75)     | 20.0             | 1.2       |
| Prime White (3.0)      | 26.0             | 1.4       |
| Standard White (3.5)   | 31.0             | 1.9       |
| Standard White (4.0)   | 36.0             | 2.5       |

**3.2.1** If IP glasses are not available, the appropriate combinations of Lovibond standards may be used, but the compound glasses are preferred.

**3.3 Cells for Liquids** — with plane parallel glass ends. The  $\frac{1}{16}$ -,  $\frac{1}{8}$ -,  $\frac{1}{4}$ -,  $\frac{1}{2}$ -, 1-, 2-, 3-, 6- and 18-inch sizes suffice for most petroleum products.

**3.4 Cells for Waxes** — which will withstand heating to 100°C constructed either of metal with glass end-plates or entirely of a heat-resistant borosilicate glass. All glass 18-inch cells are not recommended for waxes.

## 4. PRECAUTIONS

**4.1** Determinations shall be made only by persons of normal colour vision and experienced in the use of the instrument. Normality may be verified by comparing colour matches with those obtained by a number of observers, or preferably, by some procedure such as the use of the Ishihara colour charts\*.

**4.2** The apparatus, including the colour slides, shall be kept scrupulously clean; and should occasionally be checked for accuracy according to the instructions given in 7. Renew the lamps after about 100 hours use. If the paint work is discoloured, repaint the cabinet with a good-quality titanium dioxide paint which does not contain linseed oil.

\* ISHIHARA, S. Tests for Colour Blindness. London. H. K. Lewis & Co.

## 5. PREPARATION OF SAMPLE

**5.1** If it is not possible to test the samples as soon as they are taken, store them as far as possible, in the dark and under conditions which do not lead to colour instability.

**5.2** Immediately before testing them, filter all samples through a medium-texture filter paper, such as a Whatman No. 1 at the temperature at which the colour is to be determined; suction may be applied if necessary.

**5.2.1** If samples are tested at temperatures lower than that at which they are filtered, they may develop a cloudiness which would interfere with the determination of their colour.

## 6. TEST ROOM

**6.1** Use the Tintometer in a moderately lighted room (*not a dark room*) and place it so that the operator is facing a blank wall of white, cream, or pale neutral tint. Choose the height of the work bench and the placing of the instrument so that observations can be made in comfort.

**6.1.1** Colour discrimination depends a great deal on the conditions of observation, and it is, therefore, essential that due regard be given to these precautions.

## 7. PREPARATION OF APPARATUS

**7.1** Check the special composition of the illuminant occasionally by measuring the colour of a selection of representative samples first with the lamps in the Tintometer, and then with a pair of lamps kept specially for the purpose. The latter should be used for only a few minutes at a time when a check is desirable. Renew the lamps in the Tintometer if the two sets of readings show more than slight differences.

## 8. METHOD A (MEASUREMENT OF COLOUR IN LOVIBOND UNITS)

**8.1 Procedure** — Place the opal glass background in position in the white light cabinet with its matt surface towards the observer.

NOTE 1 — If the cabinet is of the type having apertures cut in the back plate, these shall be covered by some opaque white material so as to prevent extraneous light shining through the opal glass.

**8.1.1** When a choice is permitted, choose a cell of such a length that it gives a colour whose principal component has a value of at least one unit, but which does not require more than 20 units of red for a match. When using cells of 6-inch optical length or less, place the case containing the colour slides inside the white light cabinet as shown in Fig. 1. When using an 18-inch cell, remove the case containing the colour slides from the white light cabinet, and mount it on the stand provided. Place the cell so that

one end fits into the cabinet, and the other rests against the lower aperture of the slide case (*see* Fig. 3). Place the end of the cell inside the cabinet so that it is approximately 100 mm from the opal glass background and so that it does not cast a shadow on the background. Remove the wooden block which is attached to the centre of the lid of the cabinet, and close the whole of the lid.

NOTE 2 — The all glass 18-inch cell is provided with an open ended wooden box with a slot underneath which engages on the edge of the white light cabinet. This correctly locates the cell in relation to the cabinet. Part of the end of this wooden box is cut away so that it fits on to the adjustable platform holding the slide case.

**8.1.2** Fill the cell, and place it in the moulded cell channel with one clear face against the lower aperture in the slide case, as shown in Fig. 2. Close the side lids and the major section of the centre lids of the white light cabinet. Look down the eyepiece, and obtain an approximate match for the hue of the material by introducing appropriate amounts of two of the colours, for undyed products; these will normally be red and yellow. If the material appears brighter than the combination of Lovibond glasses, that is, if the glasses appear dull by comparison, superimpose the neutral tints over the sample in order to bring it to the same brightness level as the colour glasses. Unless this is done, it will be impossible to make a colour match. If, on the other hand, the sample appears more dull than the colour glasses introduce the third colour. When the three primaries (red, yellow and blue) are used together in this way they combine to produce grey and, therefore, in no circumstances may neutral tints be used over a material when all three colours are used in the other field, as this would mean that grey had been added to both sides. When a brightness balance has been obtained it will probably be necessary to adjust the other glasses slightly in order to obtain the best match of both hue and brightness in the two fields. Do not gaze into the eyepiece longer than is necessary, as fatigue reduces colour discrimination. After making a match, rest the eyes by looking away for a few minutes, and then recheck the match, revising it if necessary.

**8.1.3** When determining the colour of molten waxes, heat the cell to the same temperature as the sample before filling it, and ensure that matching is completed before the sample starts to solidify.

**8.2 Reporting** — Report first the size of cell used, and then the amounts of red, yellow and blue required to obtain a match. If neutral glasses are used to dull the sample, report them as an equivalent amount of 'Brightness'.

*For Example :*

- a) Colour, Method A,  $\frac{1}{2}$ -inch cell:  
0.7 red + 5.6 yellow + 0.3 blue.
- b) Colour, Method A,  $\frac{1}{16}$ -inch cell:  
8.2 red + 40 yellow + 0.0 blue + 1.0 brightness.

**8.2.1** Results obtained in one size of cell cannot be used to calculate the results which would have been obtained had a different size of cell been used.

## **9. METHOD B (MEASUREMENT OF COLOUR IN IP UNITS)**

**9.1 Procedure** — Pour the material into an 18-inch cell, set up the apparatus as described in 8 and measure the colour using the IP standard glasses. Do not use more than one standard glass at a time, and do not attempt to improve the match by incorporating neutral tints or Lovibond units.

**9.2 Reporting** — Report the value of the glass whose colour is equivalent to that of the material. If the colour of the material is found to be intermediate between two adjacent glasses, describe it accordingly, placing the value to which it is nearest in brackets afterwards.

*For Example :*

Colour, **P : 13**, Method B, Prime White 2.25-2.5 (2.5).

**9.3 Precision** — The precision of this method has not yet been established.